

PROJECT FACT SHEET

CONTRACT TITLE: Integrated Outcrop & Subsurface Studies of the Interwell Environment of Carbonate Reservoirs: Clear Fork (Leonardian Age) Reservoirs, West Texas and New Mexico/Fundamental Geoscience Award

ID NUMBER: DE-AC26-98BC15105

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PROJECT SITE

CITY: Austin

STATE: TX

CITY:

STATE:

CITY:

STATE:

CONTRACT PERFORMANCE PERIOD:

9/30/1998 to 9/29/2001

PROGRAM: Supporting Research

RESEARCH AREA:

PRODUCT LINE: ADIS

FUNDING (1000'S)	DOE	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	520	60	580
FISCAL YR 1999	198	60	258
FUTURE FUNDS	0	60	60
TOTAL EST'D FUNDS	718	180	898

OBJECTIVE: The Permian Clear Fork reservoirs of the Permian Basin, West Texas and New Mexico, are estimated to contain 6.5 billion barrels of remaining oil. This complex set of reservoirs is still poorly understood in terms of interwell heterogeneity and the impact of fractures on fluid flow and recovery. The Bureau of Economic Geology staff will develop new conceptual models of interwell heterogeneity for West Texas and New Mexico Clear Fork reservoirs using an integrated stratigraphic, structural, petrophysical, and engineering disciplines. The impact of fine-scale heterogeneity on fluid flow and recovery, the impact of natural fractures on reservoir performance, and techniques for predicting the distribution of high and low permeability zones in these reservoirs are the basic goals of the research. Integration of outcrop and subsurface data including stratigraphic, petrophysical, and fracture/structural data will be used in the research.

PROJECT DESCRIPTION:

Background: The Bureau has been active over the past 12 years in developing integrated geologic and engineering models of carbonate reservoirs in the Permian Basin of West Texas and New Mexico. Much of this work has been focused on the younger Grayburg and San Andres fields of the Permian Basin. The current research is designed to test models developed in these earlier studies and to develop new engineering scale-up tools and new fracture models for these reservoirs.

Work to be Performed: Task 1) Develop outcrop analog models using outcrops at Apache Canyon, Sierra Diablo Range.

Subtask 1.1) Geologic and stratigraphic model.

Subtask 1.2) Construct model of fine-scale petrophysical heterogeneity.

Subtask 1.3) Construct model of fracture porosity and permeability.

Task 2) Study subsurface reservoirs for applications of outcrop-based concepts.

Subtask 2.1) Select subsurface study area.

Subtask 2.2) Gather subsurface data.

Subtask 2.4) Analyze simulation results.

Task 3) Technology transfer.

PROJECT STATUS:

Current Work: Contract initiated - September 1998 (FY1998).

Scheduled Milestones:

Subtask 1.1 Geologic/stratigraphic model

Subtask 1.2. Construct model of fine-scale petrophysical heterogeneity

Subtask 1.3. Construct model of fracture porosity and permeability

Subtask 2.1 Select subsurface study area

Subtask 2.2 Gather subsurface data

Subtask 2.3 Construct subsurface reservoir model

Subtask 2.4 Analyze simulation results

Accomplishments: Analysis of the detailed sequence- and cycle-scale architecture of the Clear Fork reservoir-equivalent outcrops in Apache Canyon is nearly complete. The work reveals two high-frequency transgressive-regressive sequences in the lower Clear Fork composite depositional sequence and three HFS in the basal middle Clear Fork composite depositional sequence. An 1,800 ft transect of 1 inch diameter samples were collected from one cycle at the Apache Canyon outcrop. The transect was sampled with 5 ft. spacing, but there were some gaps due to cover and cliffs resulting in 181 samples. Permeability, porosity, and grain density were measured and the spatial statistics are being analyzed geostatistically.

The South Wason Clear Fork (SWCF) field has been selected as the subsurface study area. Wireline logs, production data, core data, and 3D seismic have been acquired and data analysis is proceeding. A sequence stratigraphic framework has been described that is similar to the outcrop framework; a model for calculating permeability and rock-fabric petrophysical class from wireline logs has been developed; and the analysis of fractures in cores is proceeding in order to quantify the nature of the fracture size distribution in the reservoir.

A preliminary model of matrix porosity, saturation, and permeability has been constructed for a one-mile square area in the South Wason Clear Fork field. The stratigraphic framework consists of 22 high-frequency cycles defined by upward-shallowing facies successions as defined by core examination and calibrated to wireline logs. Fracture data has been collected from the outcrop analog at Apache Canyon and has been integrated with fracture data collected from South Wason Clear Fork cores. This information will be used to model the impact of fracture permeability on performance of the middle Clear Fork reservoir.